

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
21 December 2000 (21.12.2000)

PCT

(10) International Publication Number
WO 00/76288 A3

(51) International Patent Classification: A61M 1/12

(AU) SULLIVAN, Colin, Edward [AU/AU]; 27 Wharf Road, Birchgrove, NSW 2041 (AU).

(21) International Application Number: PCT/AU00/00654

(74) Agent: SPRUSON & FERGUSON; GPO Box 3898, Sydney, NSW 2001 (AU).

(22) International Filing Date: 9 June 2000 (09.06.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PQ 0904 10 June 1999 (10.06.1999) AU

(71) Applicant (for all designated States except US): SUNSHINE HEART COMPANY PTY LTD [AU/AU]; 28D Montague Street, Balmain, NSW 2041 (AU).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (for US only): PETERS, William, Suttle [NZ/NZ]; 93 Bassett Road, Remuera, Auckland 1005 (NZ), MARSH, Peter, Crispin, Lawrence [AU/AU]; 82 Louisa Road, Birchgrove, NSW 2041 (AU), WHITE, Geoffrey, Hamilton [AU/AU]; 22 Nicholson Street, East Balmain, NSW 2041 (AU), MILSOM, Frederick, Paget [NZ/NZ]; 132 Long Drive, St Heliers, Auckland (NZ), HENRICHSSEN, Hans, Hansforth [AU/AU]; 5 Smith Close, Shalvey, NSW 2770 (AU), UNGER, Rolf, Gunnar [SE/AU]; 58A Caroline Street, Kingsgrove, NSW 2208

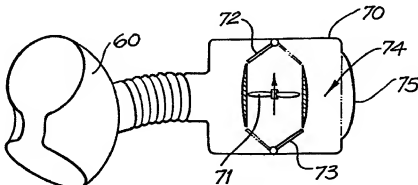
Published:

— With international search report.

(88) Date of publication of the international search report:
25 May 2001

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: HEART ASSIST DEVICES, SYSTEMS AND METHODS



(57) Abstract: A heart assist device (10) adapted for implantation into a patient (99). The device (10) includes an aortic compression means (60) adapted, when actuated, to compress an aorta (15) of a patient (99), a fluid reservoir (74) and a pump means (71) adapted to pump a fluid from the fluid reservoir (74) to the aortic compression means (60) so as to actuate the aortic compression means (60) at least partly in counterpulsation with the patient's heart. The fluid reservoir (74) is adapted to be wholly positioned within the chest cavity of the patient (99).

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU00/00654

| A. CLASSIFICATION OF SUBJECT MATTER | | |
|--|---|---|
| Int. Cl. ⁷ : A61M 1/12 | | |
| According to International Patent Classification (IPC) or to both national classification and IPC | | |
| B. FIELDS SEARCHED | | |
| Minimum documentation searched (classification system followed by classification symbols) | | |
| KEYWORDS | | |
| Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched | | |
| Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) | | |
| WPAT | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X | US 4979936 A (Stepnenson et al.) 25 December 1990 Column 6, line 24 - column 8, line 56: figures | 1-4, 6-7, 10, 17, 21, 23-35, 31-36, 38-39, 42-47, 49-50, 53, 54, 57-60 30 |
| Y | WO 92/08500 A (McGill University) 29 May 1992 | |
| X | Page 5, line 13 - page 11, line 24; figures | 1-4, 6, 17, 47, 49-50, 54, 57-60 30 |
| Y | | |
| <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex | | |
| * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family | | |
| Date of the actual completion of the international search 14 August 2000 | | Date of mailing of the international search report 18 AUGUST 2000 |
| Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929 | | Authorized officer ROSEMARY LONGSTAFF Telephone No.: (02) 6283 2637 |

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU00/00654

| C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT | | |
|---|--|--|
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X | WO 99/04833 A (Commissariat a l' Energic Atomique) 4 February 1999 Page 9, line 8 - page 13, line 16; figures | 1-4, 6-7, 10, 17, 21-25, 31-35, 47, 49-50, 54, 57-60 |
| X | EP 216042 A (Medtronic Inc.) 1 April 1987 Page 8, line 22 - page 10, line 12; Figure 1 | 47 |

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU00/00654

Box I Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos : 61
because they relate to subject matter not required to be searched by this Authority, namely:

Plant or animal varieties. (Article 34(4)(a)(i); Rule 67)
2. ☐ Claims Nos :
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos :
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

Supplemental Box

(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No: I

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-20, 55-60 are directed to a heart assist device adapted for implantation, comprising an aortic compression means. It is considered that a pump means, a fluid reservoir and the aortic compression means being actuated at least partly in counterpulsation with the patient's heart comprise a first "special technical feature".
2. Claims 21-35 are directed to a heart assist device adapted for implantation comprising an aortic compression means. It is considered that a pump means, a liquid reservoir and the aortic compression means adapted to be positioned in close juxtaposition with one another within the chest cavity comprise a second "special technical feature".
3. Claims 36-46 are directed to an aortic compression means for use with a heart assist device. It is considered that an elastic inflatable cuff adapted to be placed about the ascending aorta and a flexible, substantially inelastic sheath adapted to extend around the cuff and at least assist in retaining it in position on the aorta comprise a third "special technical feature".
4. Claims 47-54 are directed to a heart assist device comprising an aortic compression means. It is considered that the compression means being adapted to be placed around the ascending aorta, an actuation means to periodically actuate the aortic compression means in at least partial counterpulsation with the patient's heart, the aortic compression means and actuation means being placed wholly within the chest cavity comprise a fourth "special technical feature".

Since the abovementioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application does not relate to one invention or to a single inventive concept.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU00/00654

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

| Patent Document Cited in Search Report | | | Patent Family Member |
|---|---------|----|----------------------|
| WO | 9208500 | US | 5429584 |
| WO | 9904833 | FR | 2766373 |
| EP | 216042 | US | 4813952 |
| END OF ANNEX | | | |